



## Highlights

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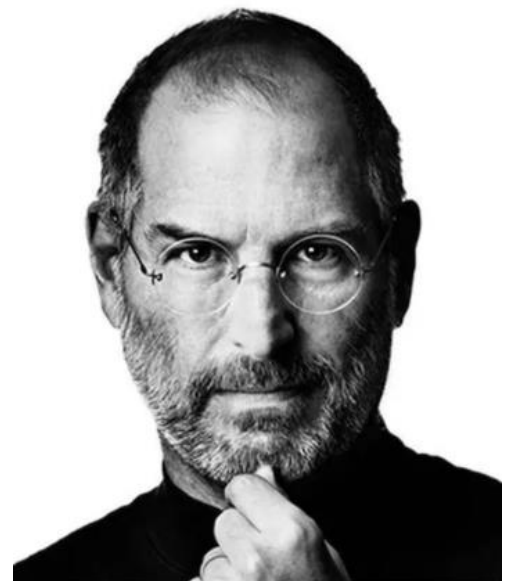
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Thus far, we're pretty much using our computers as good servants. We ask them to do something, we ask them to do some operation like a spread sheet, we ask them to take our keystrokes and make a letter out of them, and they do that pretty well. And you'll see more and more perfection of that—computer as servant. But the next thing is going to be computer as guide or agent. And what that means is that it's going to do more in terms of anticipating what we want and doing it for us, noticing connections and patterns in what we do, asking us if this is some sort of generic thing we'd like to do regularly, so that we're going to have, as an example, the concept of triggers. We're going to be able to ask our computers to monitor things for us, and when certain conditions happen, are triggered, the computers will take certain actions and inform us after the fact.



Steve Jobs, [1985 Interview](#)



**NetApp**



**WEKA**

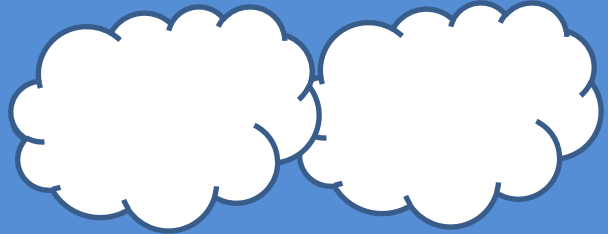
**KIOXIA**

The Explosion in Imagery from Radiometry,  
Cryo-EM, and Other Imaging Technologies:  
Can Storage Keep Pace?

Tuesday, November 9 at 10am PST

**G2M**  
RESEARCH

**Cloud Infrastructure Spending  
Down, But It Will Be Okay.**



Ah, the doom and gloom of journalism! Cloud infrastructure spending drops for the first time since pandemic began! Cloud infrastructure Spending Decreased 2.4% in 2Q21 to \$16.8B! Well, time to wraps things up and go hide under the covers, right?

The reality is that any decline, after six quarters of year-to-year growth, initially primarily propelled by the unique circumstances of a pandemic, pales in relation to International Data Corporation (IDC) forecast for public cloud infrastructure and platform as a service workloads which projects worldwide revenue of \$400B in 2025, at a compound annual growth rate of 28.8%. [Worldwide Public Cloud IaaS and PaaS Workloads Forecast, 2021–2025](#) (IDC #US48032921). Not too shabby, eh?

Application development and testing, structured data management, and structured data analytics will be the largest workload segments by revenue share. Unstructured data analytics/data management and media streaming are forecast to be the fastest growing segments with CAGRs of 41.9% and 41.2%, respectively.

Enterprises are using cloud infrastructure [to scale](#), regardless of workload type.

Projections include spending on compute and storage cloud infrastructure to have a CAGR of 12.4% over the 2020-2025 forecast period, reaching \$118.8 billion in 2025 and accounting for 67.3% of total compute and storage infrastructure spend. Shared cloud infrastructure will account for 69.9% of this amount, growing at a 12.4% CAGR. Spending on dedicated cloud infrastructure will grow at a CAGR of 12.3%. Non-cloud infrastructure will flatten out at a CAGR of 0.1%, reaching \$57.7 billion in 2025. Spending by service providers on compute and storage infrastructure is expected to grow at a 11.2% CAGR, reaching \$115 billion in 2025.

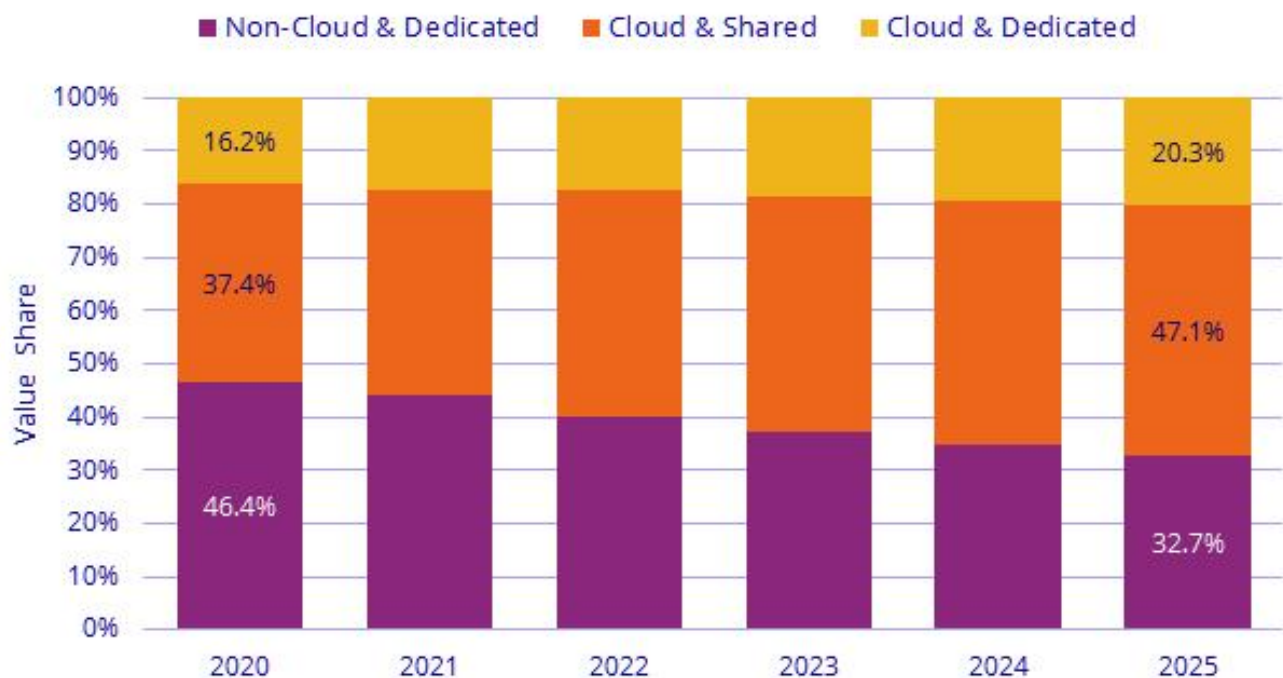
"Enterprise spending on public cloud infrastructure continues to grow faster than traditional IT infrastructure segments," "We expect all workload segments to grow in the double digits — some slightly faster than others — as enterprises emerge from 2020 and continue to prioritize workload migration and modernization using public cloud infrastructure."

[Andrew Smith](#), Research Manager [Cloud Infrastructure Services, IDC](#)



Spending on shared cloud infrastructure reached \$11.9 billion, a decrease of 6.1% compared to 2Q20, and a 17% increase from 1Q21. Spending on dedicated cloud infrastructure increased 7.8% year over year in 2Q21 to \$4.9 billion with 46.5% of this amount deployed on customer premises. Analyst firm expects that cloud environments will continue to outpace non-cloud throughout its forecast.

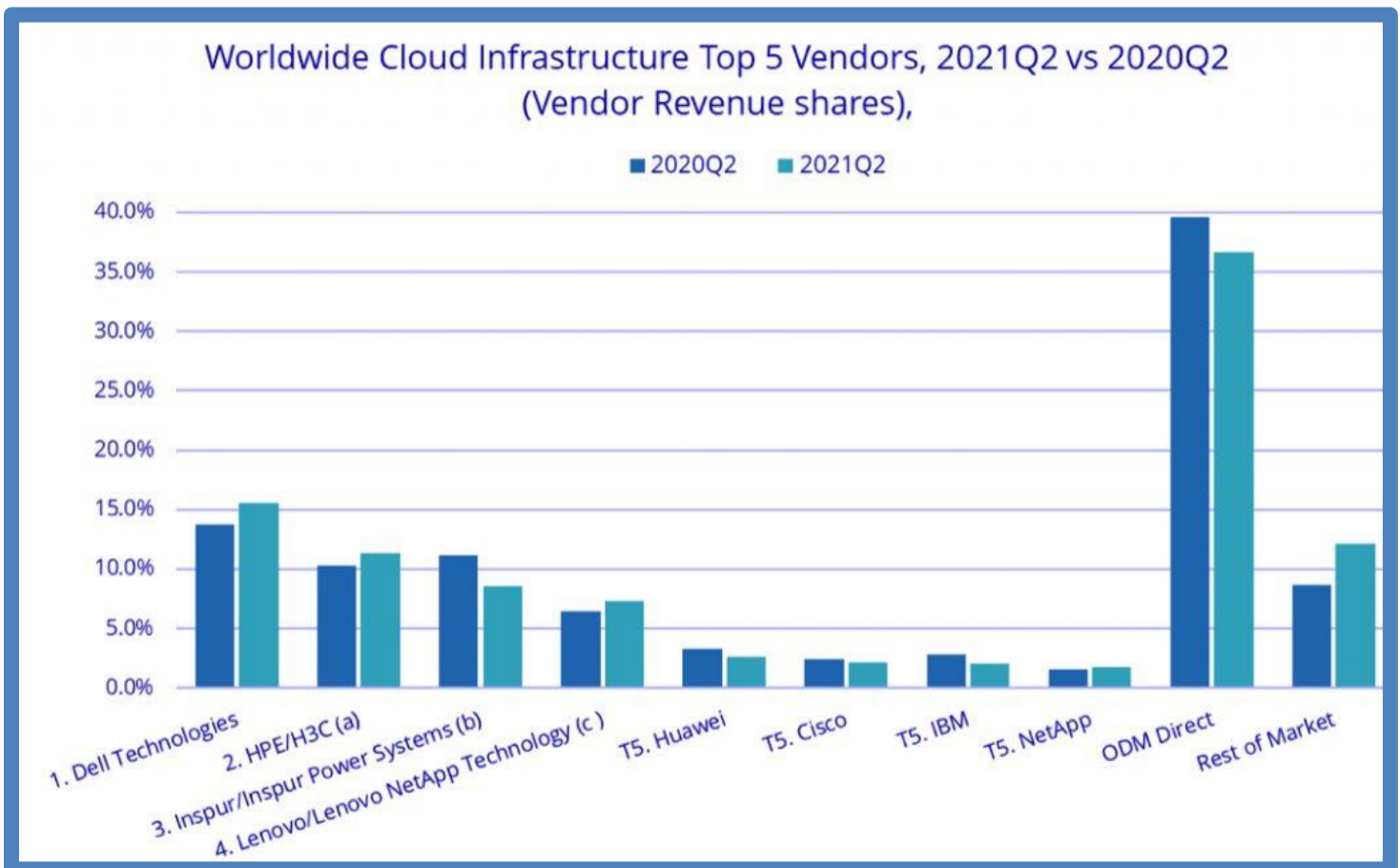
### Worldwide Enterprise Infrastructure Buyer & Cloud Deployment Forecast, 2020 - 2025 (spending)



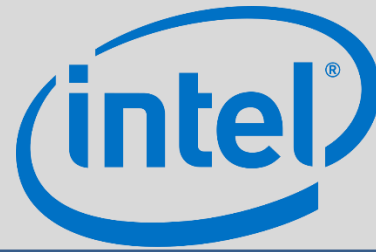
IDC is forecasting cloud infrastructure spending to grow 12% to \$74.3 billion for 2021, while non-cloud infrastructure is expected to grow 2.7% to \$58.9 billion after 2 years of declines. Shared cloud infrastructure is expected to grow by 11.1% Y/T to \$51.4 billion for the full year. Spending on dedicated cloud infrastructure is expected to grow 14.1% to \$22.8 billion for the full year. In 2Q21, service providers as a group spent \$17.1 billion on compute and storage infrastructure, down 1.9% from 2Q20 and up 13.6% from 1Q21. This spending accounted for 56.5% of total compute and storage infrastructure market. It is expected that compute and storage spending by service providers to reach \$74.6 billion for 2021, growing at 10.5% Y/Y.

“Weakness in Y/Y demand from public cloud service providers comes after an exceptionally strong 2Q20, in which spending increased 55.5% driven by the spike in demand for cloud services in the first months of the pandemic. Such discrepancy in growth rates attributable to exceptional events creates “hard” comparisons that don’t reflect long-term trends. IDC expects to see continuously strong demand for shared cloud infrastructure with shared cloud infrastructure spending surpassing non-cloud infrastructure spending by 2022.”

Spending increased in Latin America, Canada, and Central and Eastern Europe, and declined in the United States, Western Europe, and the Middle East and Africa. Canada showed the strongest Y/Y increase in cloud infrastructure spending in 2Q21 at 25.6% while Western Europe recorded the strongest decline at 8.8%. For the full year, spending on cloud infrastructure is expected to increase across all regions compared to 2020.



# Intel Outperforms Samsung In Head to Head Challenge



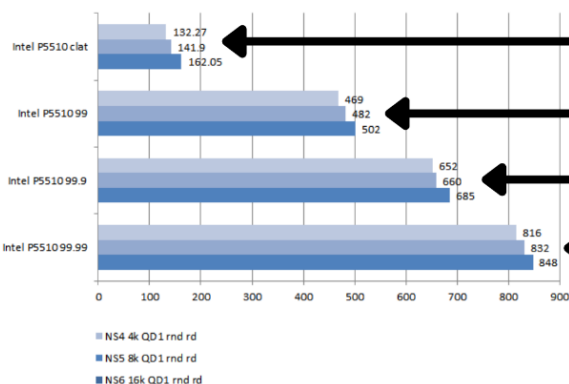
Storage Review's [analysis](#) of [Intel P5510](#) vs [Samsung PM9A3](#) Enterprise SSDs was thorough and intensive. While [Brian Beeler](#) was quick to politely comment on each and talk about the giants amongst us, and phew, what a whirlwind it was, we won't hesitate to declare a winner. Intel crushed Samsung – especially if you are actually looking for a bottom line, instead of a participation trophy for each. This is business and competition drives, motivates, propels companies to greatness (or demise). Let's not hesitate to call it like it is – for everyone's good, including the competitors.

From a similarities perspective, the [Intel P5510](#) NVMe SSD has 3.84TB and 7.68TB capacities, all in the U.2 form factor. The [Samsung PM9A3](#) Enterprise SSD has 960GB, 1.92TB, and 15.36TB capacities in a variety of form factors (though not all are available in every form factor). Both are rated at one drive write per day.

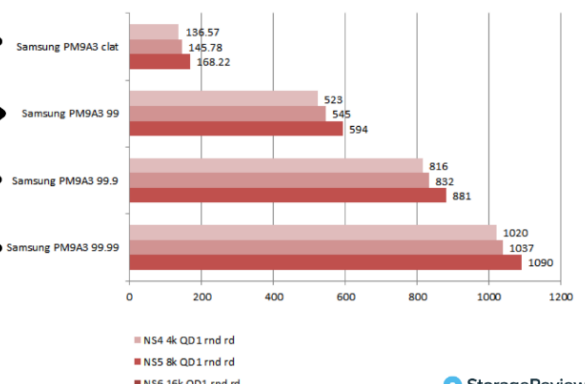
The two Intel SSD samples started with a completion latency (CLAT) of 78 microseconds and increased to 211 microseconds at a level of 700MB/s. The Samsung PM9A3 started at 82 microseconds to 251 microseconds at 700MB/s. At 800MB/s the Intel P5510 had a 108-microsecond lead over the Samsung PM9A3. For read-workloads NS4, NS5, and NS6, Intel P5510 measure 132, 141, and 162 microseconds compared to Samsung PM9A3 at 136, 145, and 168 microseconds. Moving up to 99<sup>th</sup> percentile latency, we measure Intel P5510 at 469, 482, and 502 microseconds for NS4, NS5, and NS6, compared to the Samsung PM9A3 at 523, 545, and 594 microseconds. At 99<sup>th</sup> percentile latency, we measure Intel P5510 at 652, 660, and 685 microseconds versus Samsung PM9A3 at 816, 832, and 881 microseconds. At 99.99<sup>th</sup>, Intel clobbers Samsung with 816, 832, and 848 microseconds against Samsung PM9A3 with 1020, 1037, and 1090 microseconds.

Storage Review's Sysbench testing leveraged Percona PostGres SQL to drive I/O to a MySQL OLTP database. With a 16VM load (2VMs per SSD), Storage Review measured 38,838 TPS from the group of eight Intel P5510 SSDs, whereas the Samsung PM9A3 group measured 38,717 TPS. Lowering the load

**P5510 - QD1 Random Read QoS (µsec)**



**9A3 - QD1 Random Read QoS (µsec)**



5 µsec lower

70 µsec lower

177 µsec lower

217 µsec lower

to 8VMs or 1 per SSD, the Intel P5510 group measured 30,337 TPS while the Samsung PM9A3 group measured 29,438 TPS.

On the 99th percentile latency in Sysbench, the group of Intel P5510 SSDs was measured at 25.35ms running 16VMs and 14.50ms with a workload of 8VMs. This was in contrast to the Samsung PM9A3 SSDs measuring 26.21ms at 16VMs and 14.74ms at 8VMs.

In synthetic benchmarks, Intel P5510 led in workloads that focused on mixed data profiles, with a widening gap as the workload skewed more write-based and improved with increases in block sizes, where we see its growing lead moving from 4K to 8K to 16K transfer sizes.

Intel outperformed Samsung as an applied write workload increased in increments of 10MB/s up to 850MB/s. At 800MB/s, the Intel P5510 had a 108 microsecond lead over Samsung PM9A3 in completion latency and 196.5 microsecond lead in 99th percentile latency.

[Storage Review examined both products from every angle possible](#). Noisy neighbor workload, mixed write workloads to three of six provisioned namespaces: Intel continued to maintain lower read latency, with an increasing gap as you looked up to four 9's of latency responsiveness. For application workload across the group of 8 Intel P5510 and Samsung PM9A3 SSDs, both drives were able to saturate our SQL Server test down to 1ms of total response time. In Sysbench, when CPUs were being fully utilized, the P5510 outperformed the PM9A3 in both 8VM and 16VM workloads.

Intel P5510 SSD drives consistently demonstrate less latency under the most demanding situations and they guarantee this performance with a five-year warranty versus Samsung's three-year warranty. Intel takes this head to head challenge, the clear winner.

## Intel® SSD D7-P5510 Key Specifications

Performance <sup>1</sup>				New Features	
Comparison	Spec	Gen to gen			
4K Rand. Read/Write	Up to 930K/190K IOPS	<b>45% / 41%</b> higher <sup>2</sup>		Health Monitoring	Improved drive monitoring and management
Read/Write Bandwidth	Up to 7000/4194 MB/s	up to <b>118% / 35%</b> higher <sup>3</sup>		Dynamic Multiple Namespace	Flexibility for multi-tenant/virtualized environments
Mixed Performance IOPS	400K IOPS	up to <b>50%</b> higher <sup>4</sup>		Cloud performance	New algorithms and features tuned for cloud workloads
Endurance	1+ DWPD	up to <b>17%</b> higher <sup>5</sup>		Data Integrity and Security	
Average Latency	86/16us	up to <b>14%</b> better <sup>6</sup>		End-to-End Data Protection	Industry-leading protection from silent data corruption <sup>B</sup>
Accelerated TRIM time	<100ms	up to <b>~100x</b> better <sup>7</sup>		PLI	Protection from unplanned power loss
Form Factor & Capacities				Data Security	Enterprise security features
Form Factor	U.2 15mm				
Storage capacity	3.84TB, 7.68TB				

See Appendix for workloads and configurations. Results may vary.

**Infinidat Lands  
Industry Giant  
Eric Herzog**

# INFINIDAT

[Infinidat](#) persuaded thirtyfive-year enterprise storage veteran, [Eric Herzog](#), to serve as [Chief Marketing Officer](#) after nearly seven years as CMO and VP of Global Storage Channels at [IBM Storage Solutions](#) where he was responsible for worldwide product marketing and management for IBM's storage systems, software-defined storage, hyper converged infrastructure, and global storage channels.

Eric Herzog has managed all aspects of marketing, product management, and business development in both start-ups and Fortune 500 companies. His efforts as CMO at IBM have resulted in a number of prominent awards including "[Marketer/CMO of the Year](#)" (Jan 2021), "[Top 100 Hybrid Cloud Influencers](#)" (March 2021), and "[Top 100 AI and Big Data Influencers](#)" (March 2020).



Herzog has expertise in storage systems and software, cloud computing, converged infrastructure, and storage defined storage spanning OEM, channel, and end user market segments and touts a career of consistently exceeds P&L targets, while delivering programs on time and on budget. His specialties include P&L Responsibility, Strategic Marketing and Business Planning, Business and Corporate Development, Product Launch, Venture Fund Raising, Mergers and Acquisitions, Channel

Marketing and Development. Herzog has worked at eight startups, five of which had been acquired.

Herzog: "Infinidat is the most innovative enterprise storage company at scale in the world today, delivering an AI-driven set-it-and-forget-it approach with unprecedented 100 per cent availability, superior performance that is faster than all-flash alternatives, an extensive storage software defined portfolio, and lower total cost of ownership."

*"Eric's broad product and market knowledge and deep relationships in the enterprise storage industry make him a great asset for the Infinidat team as our CMO. ..."* "With his proven track record of building and scaling high-performing marketing teams, results-driven go-to-market execution, elevating brands and introducing new products, *Eric will play a key role in further accelerating our global momentum at an exciting time of tremendous growth at the company.*" [Phil Bullinger](#), CEO, Infinidat



In his new role as CMO of Infinidat, Herzog will lead the company's global marketing and brand strategy and execution. His responsibilities span across product marketing, go-to-market strategies, brand-building, marketing programs, strategic communications, competitive analysis, and strengthening relationships with industry influencers and stakeholders.

Herzog said: "I'm excited about the opportunity to reach every enterprise and service provider that will benefit from the power and flexibility of Infinidat solutions. With best-in-class solutions, exceptional support, motivated channel partners, and an exciting vision for the future, we will expand the Infinidat brand to a leadership position in enterprise storage."

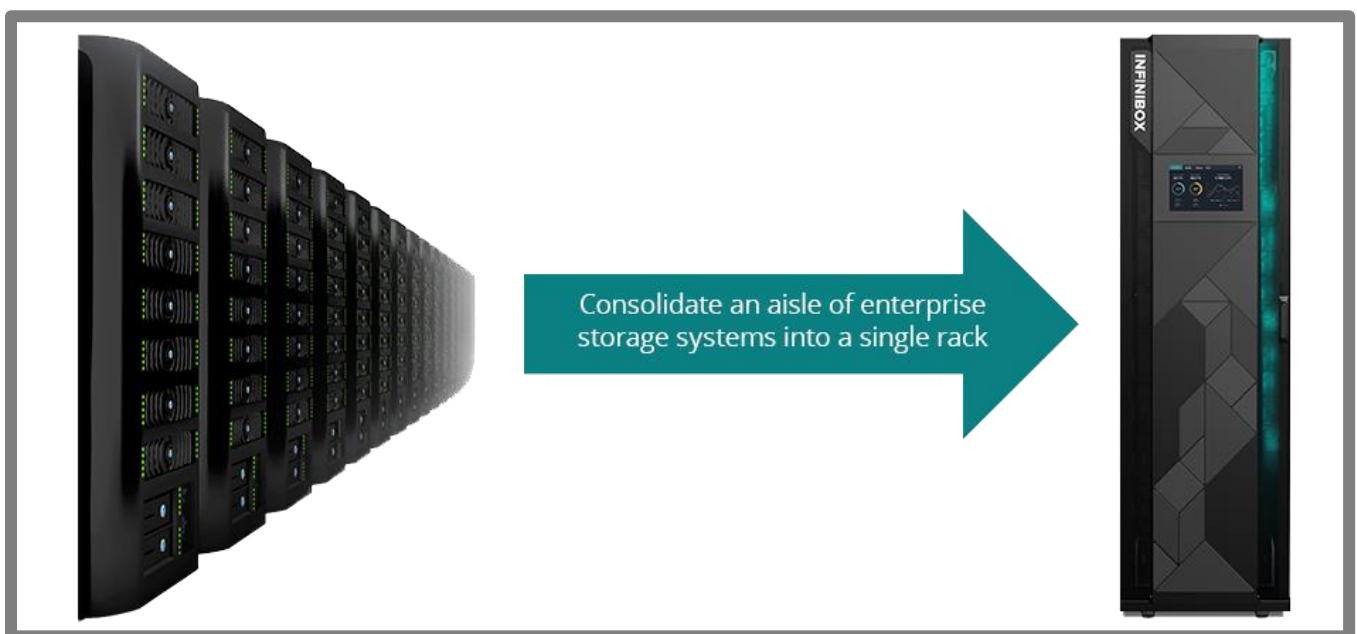
*Join a rocketship. Award-winning Infinidat is growing multiple double digits per quarter and we are looking for award-winning Sales Development Representatives to join our WINNING team. If you constantly deliver above the rest, then Infinidat is for you –*

[Eric Herzog, Twitter, October 27](#)



ESG founder and Senior Analyst [Steve Duplessie](#): "Eric Herzog is one of the most high-energy and dynamic marketing professionals in the industry that I've ever known, and I've known everyone. Infinidat has been a 'best kept secret' for far too long. That is about to change! Great for the both of them."

Why join another startup? Herzog explains, "I'm an adrenalin junkie. I like innovation and Infinidat is innovating faster than others. Infinidat Is the ultimate adrenaline junkie challenge ... It's a David and Goliath thing" (though, one might argue that it is Herzog himself who is the industry giant).





## Microsoft & GM Electric Vehicles Collaboration



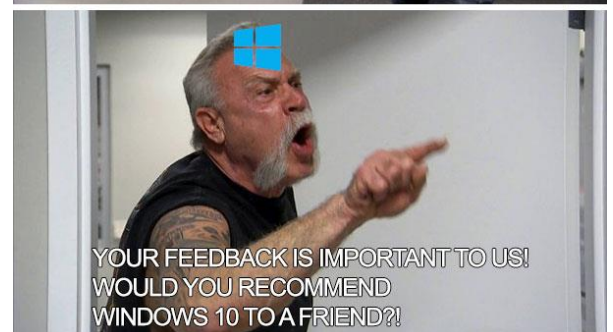
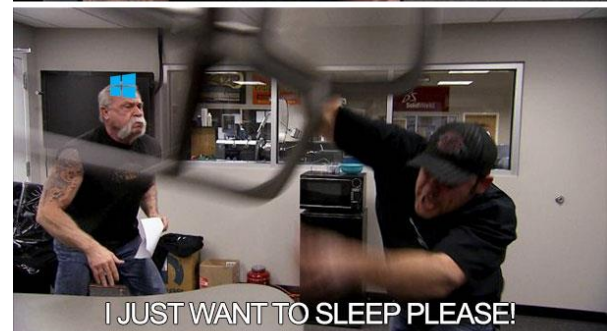
Microsoft



An old technology joke imagines a conversation with Bill Gates comparing the computer software industry to the auto industry: "If GM had kept up with the technology like the computer industry has, we would all be driving \$25.00 cars that got 1,000 miles to the gallon."

And, imagine how General Motors might respond. "If GM had developed technology like Microsoft, we would all be driving cars with the following characteristics:"

1. For no reason whatsoever, your car would crash twice a day.
2. Every time they repainted the lines in the road, you would have to buy a new car.
3. Occasionally your car would die on the freeway for no reason. You would have to pull over to the side of the road, close all of the windows, shut off the car, restart it, and reopen the windows before you could continue. For some reason you would simply accept this.
4. Occasionally, executing a maneuver such as a left turn would cause your car to shut down and refuse to restart, in which case you would have to reinstall the engine.
5. Macintosh would make a car that was powered by the sun, was reliable, five times as fast and twice as easy to drive but would only run on five percent of the roads.
6. The oil, water temperature and alternator warning lights would all be replaced by a single "general protection fault" warning light.
7. New seats would force everyone to have the same sized butt.
8. The airbag system would ask "are you sure?" before deploying.
9. Occasionally, for no reason whatsoever, you car would lock you out and refuse to let you in until you simultaneously lifted the door handle, turned the key and grabbed hold of the antenna.



10. Every time GM introduced a new car, car buyers would have to learn to drive all over again because none of the controls would operate in the same manner as the old car.

And, of course, you would have to press the "start" button to turn the engine off.

NOW, 2021 and jokes aside, [Microsoft](#) and [General Motors](#) are [joining forces](#) to accelerate commercialization of self-driving vehicles using their software and hardware engineering, cloud computing, and manufacturing skills.

“Microsoft is a great addition to the team as we drive toward a future world of zero crashes, zero emissions and zero congestion,” said GM Chairman and CEO [Mary Barra](#). “Microsoft will help us accelerate the commercialization of Cruise’s all-electric, self-driving vehicles and help GM realize even more benefits from cloud computing as we launch 30 new electric vehicles globally by 2025 and create new businesses and services to drive growth.”

General Motors will work with Microsoft as its preferred public cloud provider to accelerate its digitization initiatives, including collaboration, storage, artificial intelligence, and machine learning capabilities. GM will work with Microsoft to streamline operations across digital supply chains, foster productivity, and bring new mobility services to customers faster.



Microsoft invested in [\\$30B](#) driverless car company [Cruise](#). GM purchased Cruise over \$1B+ in 2016 and grew the business from 40 to 2000 employees and accounts for over 40% of GM’s \$71.5B market capitalization.

## AI/ML Storage: Distributed vs Centralized Architectures

with Sponsors [WEKA](#), [Excelero](#), and [AIC](#)

How big is your largest AI/ML storage pool today? (check one):

1PB or greater:	12%
Between 250TB and 1PB:	9%
Between 100TB and 250TB:	6%
Between 25TB and 100TB:	6%
Less than 25TB:	21%
Don't know/no opinion:	47%

How much cloud storage capacity do you use for AI/ML today? (check one):

Greater than 5PB of cloud storage:	8%
1PB to 5PB of cloud storage:	0%
100TB to 1PB of cloud storage:	13%
Less than 100TB of cloud storage:	13%
We don't use cloud storage for AI/ML:	29%
Don't know:	38%

## G2M Research Multi-Vendor Webinar Series

Our Oct 20 webinar [“Why Flash Memory at Scale Should be Software Defined”](#) is the first in a four part custom webinar series with industry leader, [KIOXIA](#). Each webinar stands alone and collectively provides an overview of the innovation, direction, and leadership KIOXIA provides in this enterprise storage space. The video is available to [view](#) and a copy of the slidedeck is available [here](#).

Our webinar schedule is below, including the second in the [KIOXIA](#) series on November 17. Click on the topics to get more information about that specific webinar. You can [view](#) all our webinars and [access](#) all the slide deck presentations.

To sponsor any of our webinars, contact [G2M](#) for a prospectus.

- Nov 9: [The Explosion in Imagery from Radiometry, Cryo-EM, and Other Imaging Technologies: Can Storage Keep Pace?](#)
- Nov 17: [The Next Flash Revolution at Scale: Open Source Software + Software Enabled Flash Technology](#)
- Dec 14: [2021 Enterprise Storage Wrap-up Panel Discussion](#)
- Feb 1: [Storage Architectures for High-Performance Computing](#)
- Feb 15: [Cybersecurity: Zero Trust or Trust Your People](#)
- March 8: [Storage Architectures for AI & ML](#)
- March 29: [Storage Technologies for Datacenters in Space](#)
- April 26: [Effective Architectures for Edge Computing & Storage](#)
- May 24: [Data, Networking, & Storage Acceleration](#)
- June 21: [Scaling Storage Capacity & Bandwidth Effectively](#)
- July 19: [Hot Semiconductor Startups: Changing the Rules](#)
- Aug 23: [Advanced NVMe SSDs](#)
- Sept 13: [Public/Private Storage Architectures for CSPs](#)
- Oct 11: [Storage Fabrics for Mega-Datacenters](#)
- Nov 8: [Securing Cloud Datacenters Resources](#)
- Dec 13: [What was Hot \(or Not\) in 2022, and Predictions for 2023](#)



### Upcoming Conferences

November 8-11	<a href="#">Black Hat Europe</a> , London
November 9-10	<a href="#">OCP Global Summit</a> , San Jose
November 15-18	<a href="#">SC21</a> , St Louis
November 29- Dec 3	<a href="#">Amazon re:Invent</a> , Vegas
January 5-8	<a href="#">CES 2022</a> , Vegas
January 26-28	<a href="#">SNIA 2021 Annual Members Symposium</a> , Virtual
February 7-10	<a href="#">RSA Conference</a> , San Francisco & Virtual
February 8-11	<a href="#">ITExpo</a> , Fort Lauderdale
February 28- March 3	<a href="#">MWC Barcelona</a>
March 2-3	<a href="#">Cloud Expo Europe</a> , London
March 14-17	<a href="#">Gartner Data &amp; Analytics Summit</a> , Orlando
April 23-27	<a href="#">NAB</a> , Vegas



Effective Marketing & Communications  
with Quantifiable Results